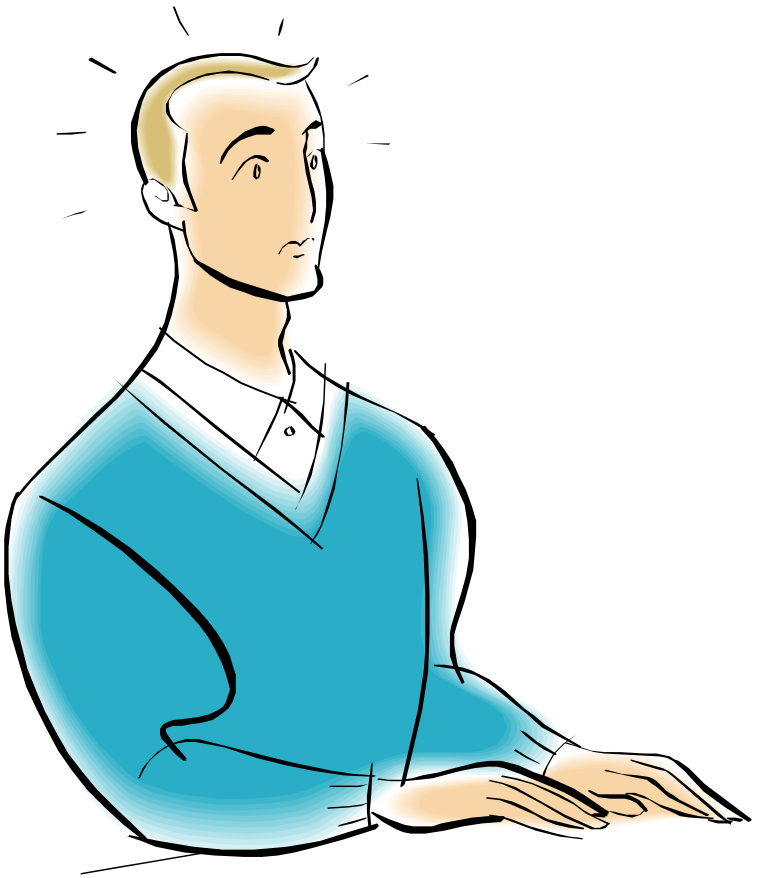
Fundamentals of Asset Management

Step 1. Develop Asset Registry

A Hands-On Approach

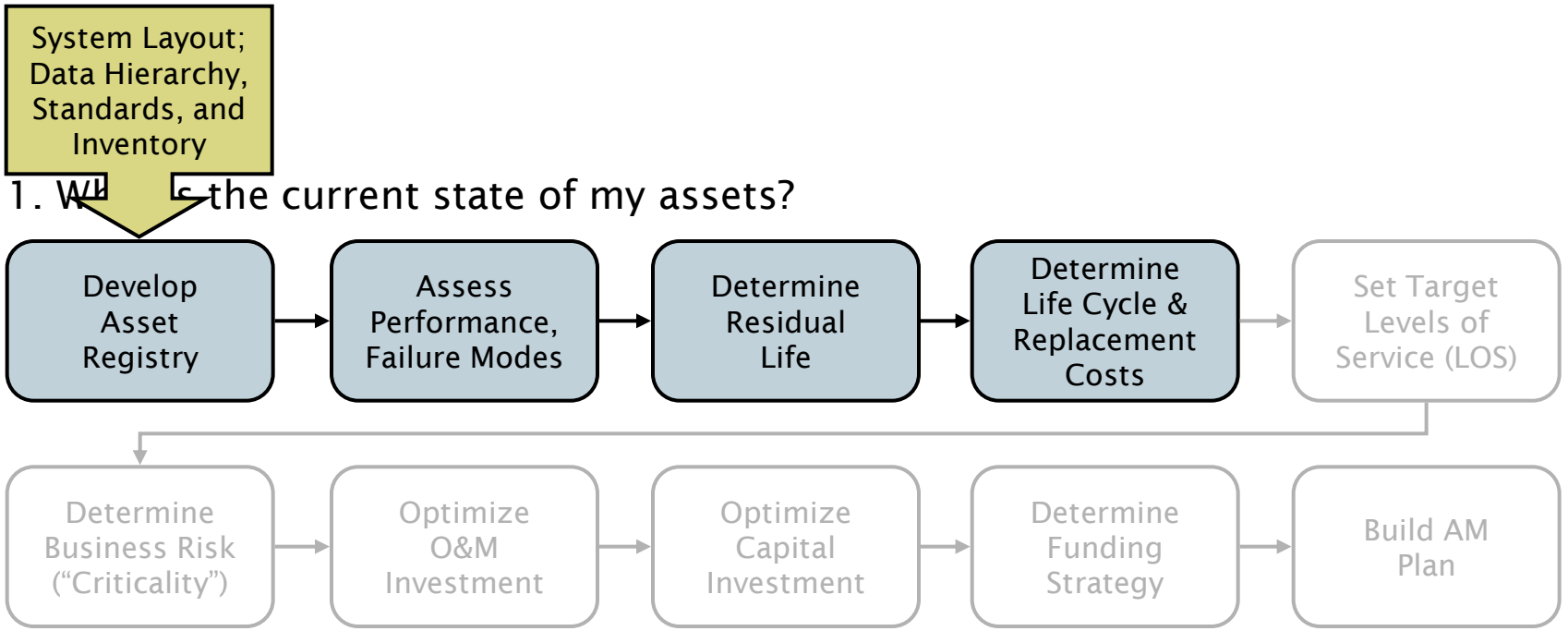
Tom’s bad day…



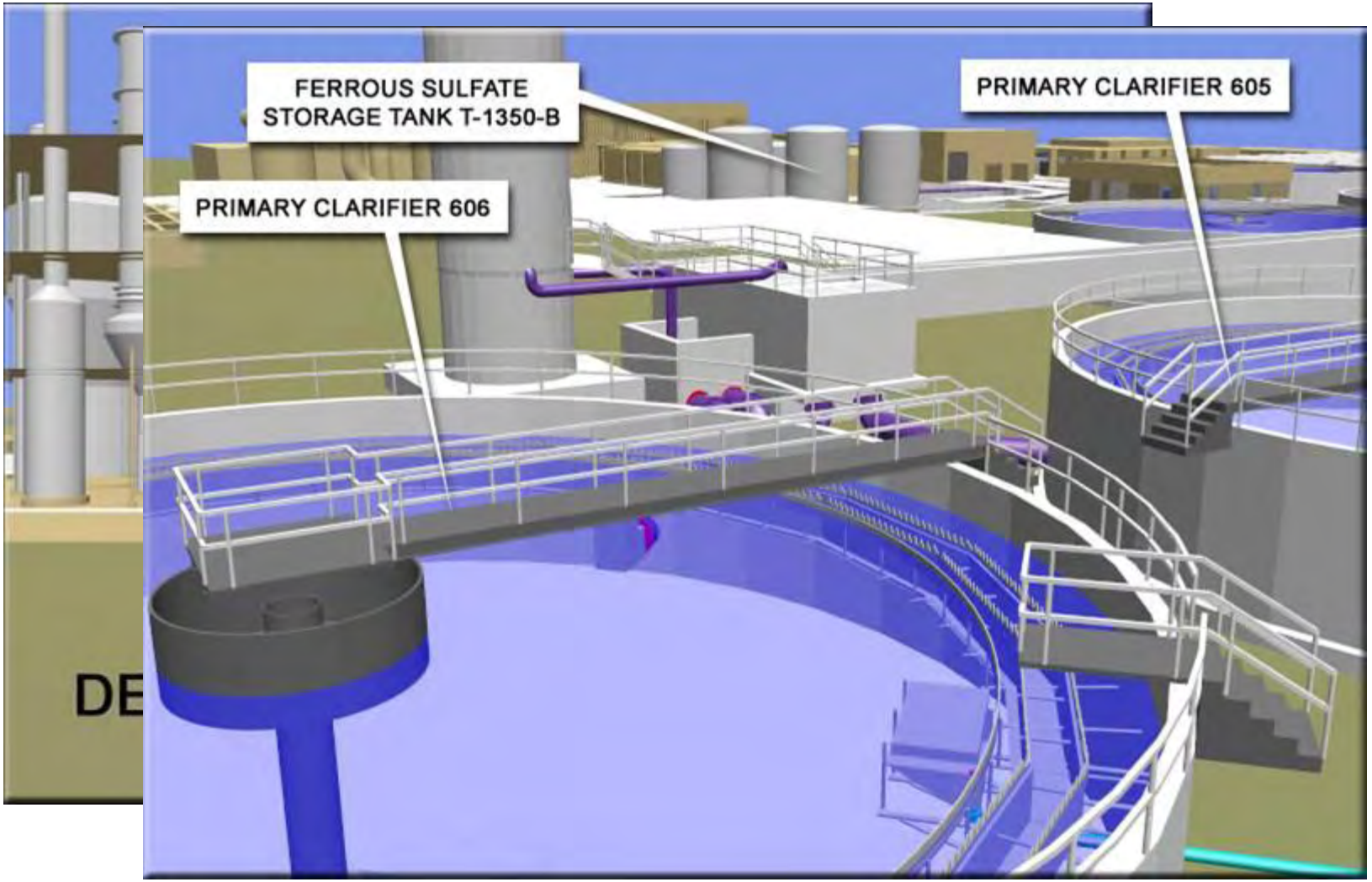
First of 5 core questions

1. What is the current state of my assets?
   - *What* do I own?
   - *Where* is it?
   - What *condition* is it in? What is its *performance*?
   - What is its *remaining useful life*?
   - What is its *remaining economic value*?

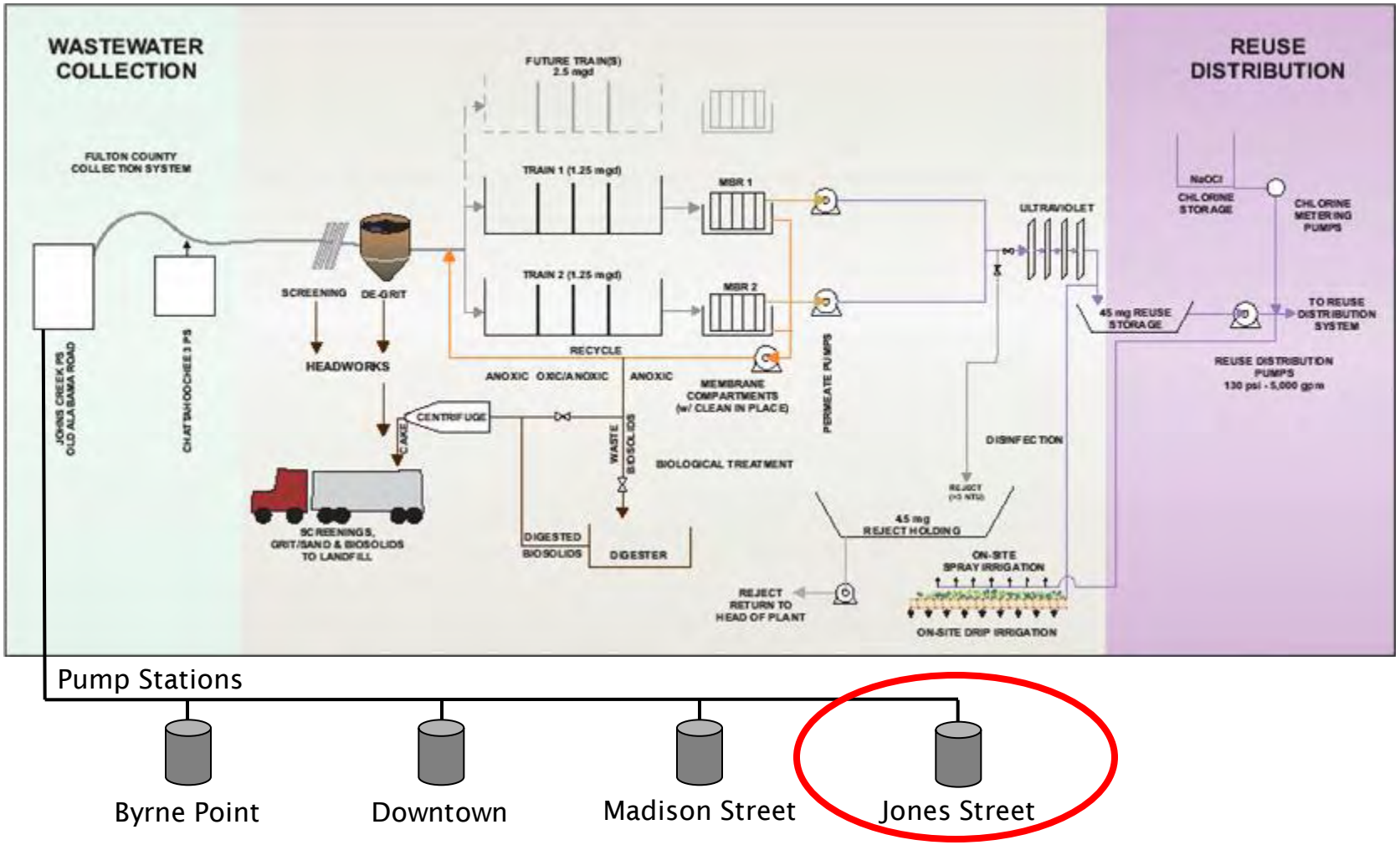
AM plan 10-step process



What exactly is an asset?



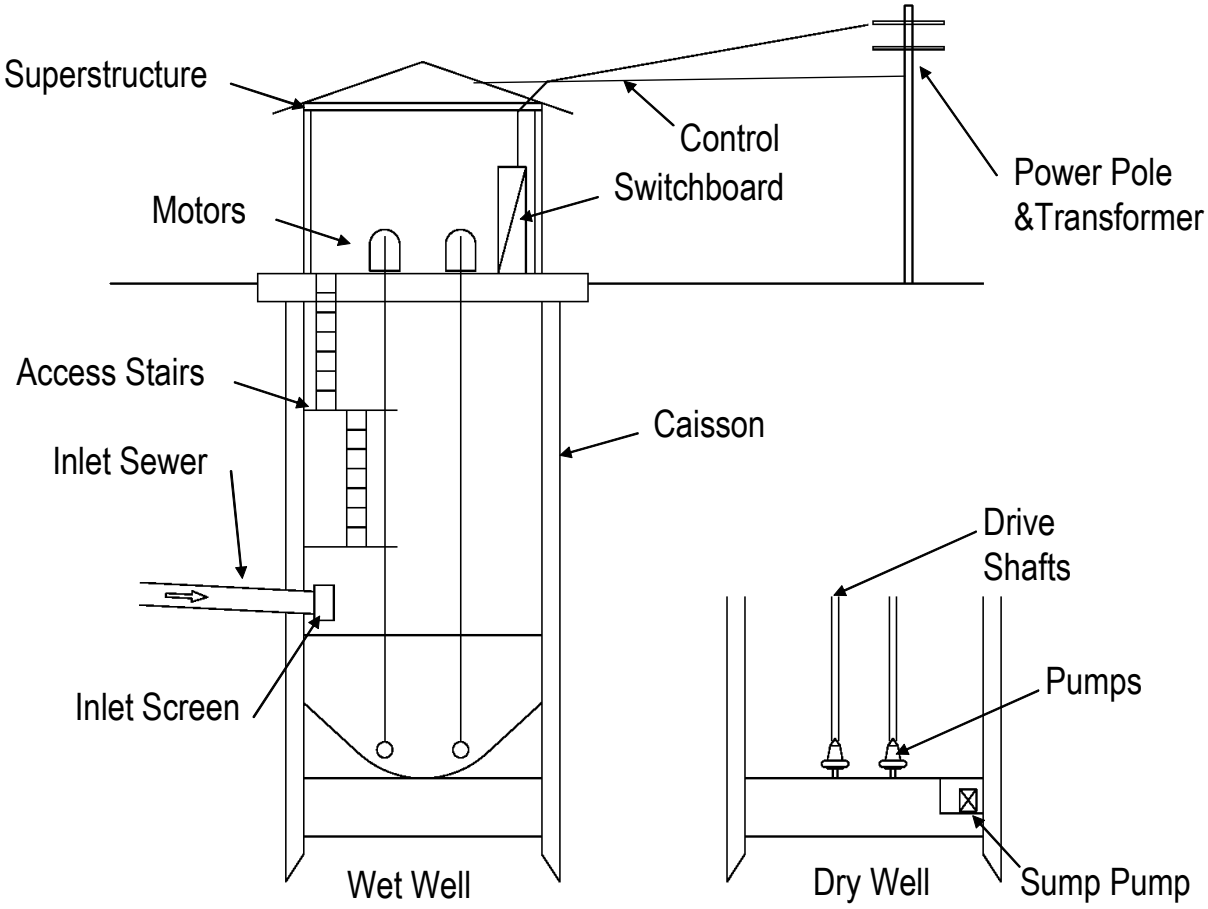
Tom's wastewater system diagram



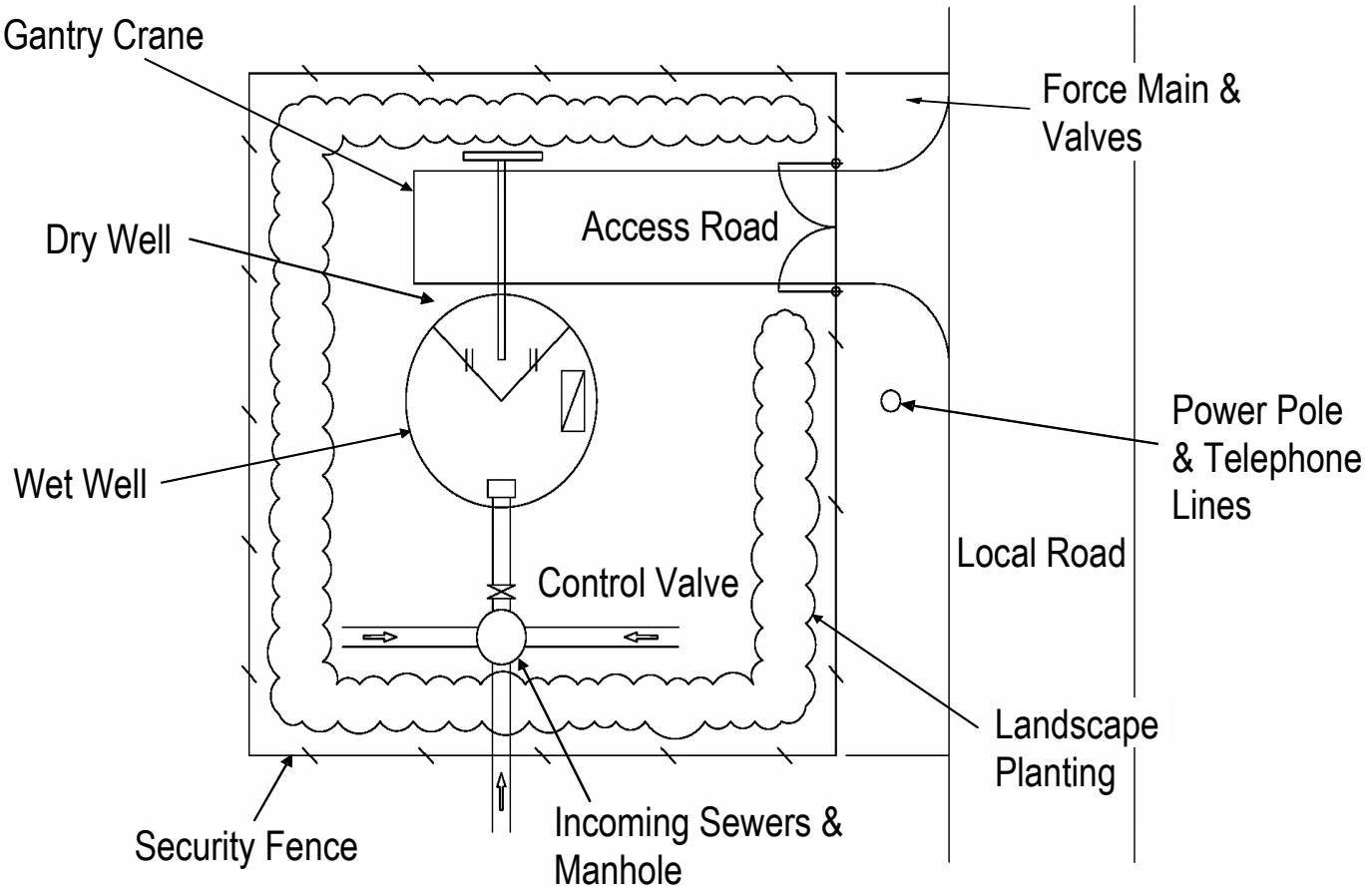
Pump Stations

Byrne Point | Downtown | Madison Street | Jones Street

Jones Street pump station cross-section view



Jones Street pump station “aerial” view

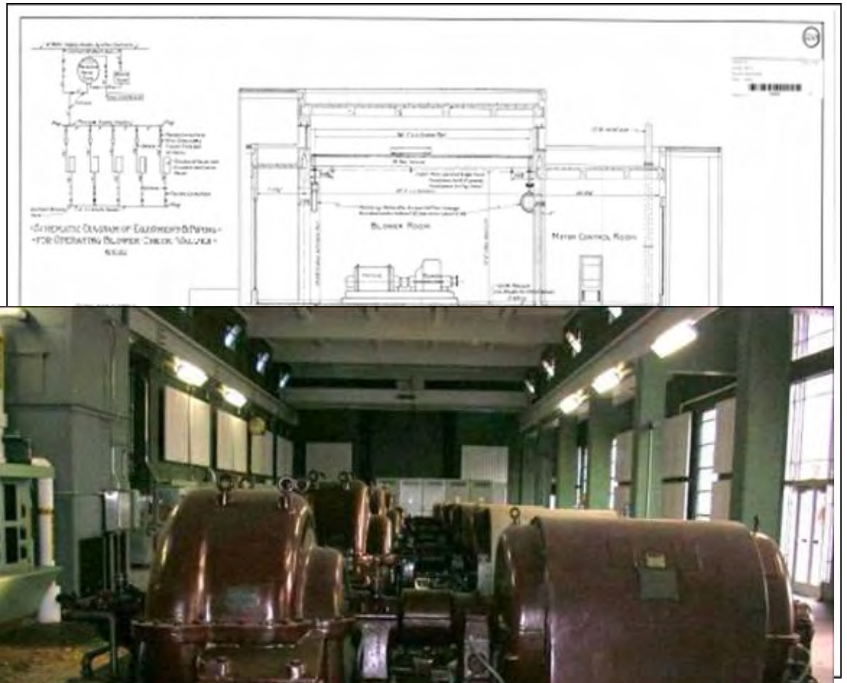


What is an asset register?

- *Systematic recording* of all assets an organization owns or for which it has responsibility
- Uses *asset identification numbers* to which attribute information can be linked

Sources of data

- As-built drawings
- Design drawings
- Manufacturers' manuals
- Bid documents
- Schedules of quantities
- Staff—current and previous
- Photos and videos

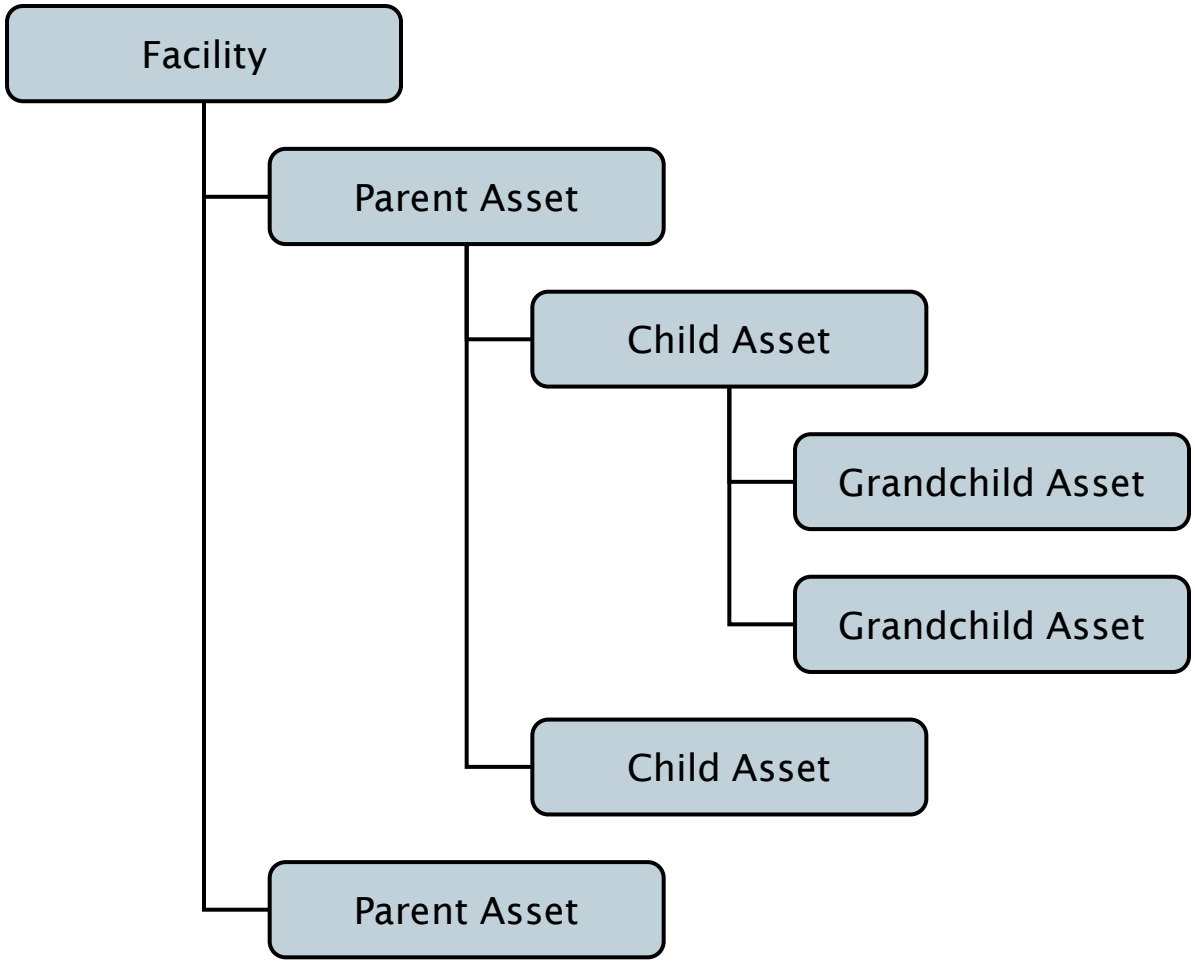


Types of asset registers

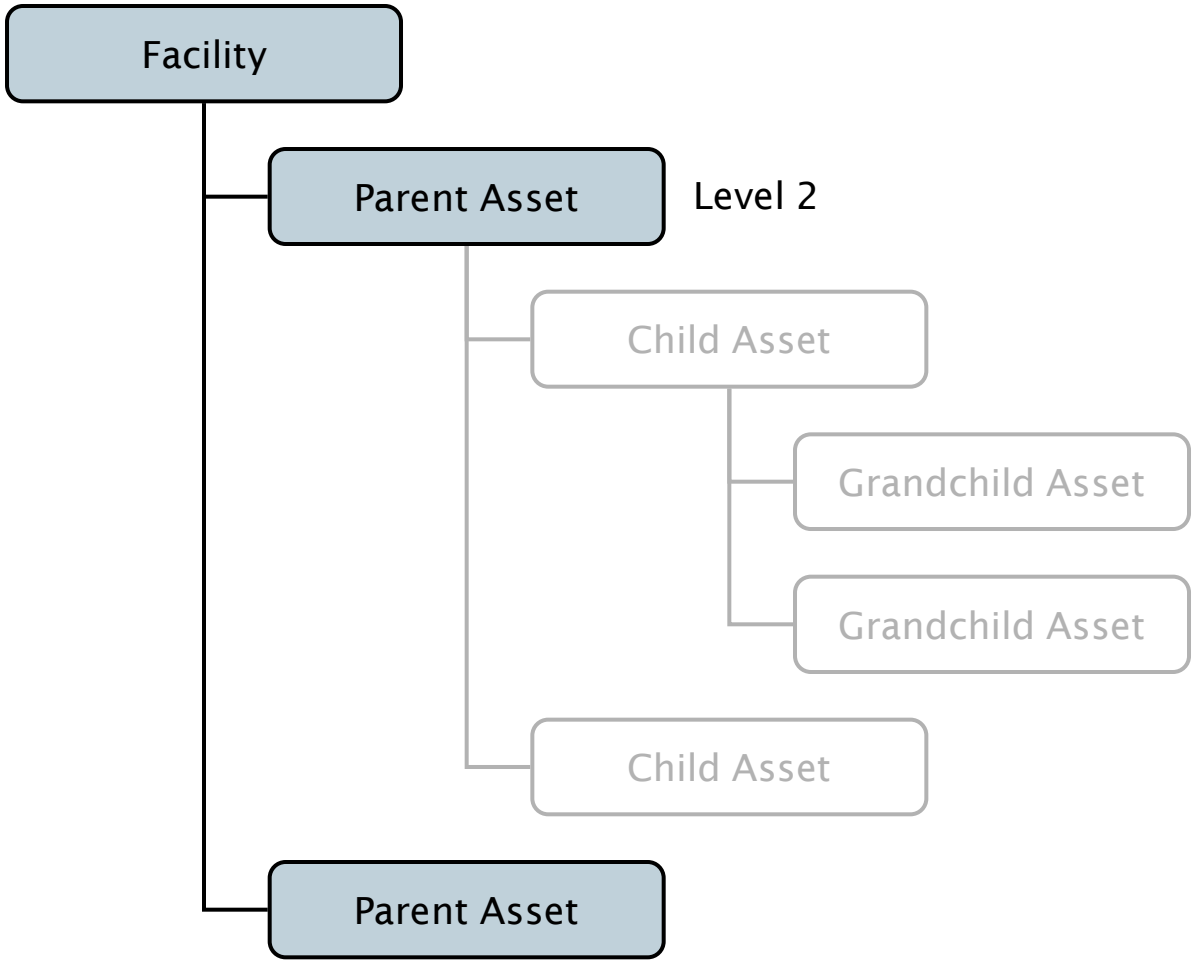
- Hierarchical—parent, child
- Category-based
- Process loops
- Spatial relationships—GPS-generated
- Business unit responsibilities
- Service provisions

GPS is global positioning system

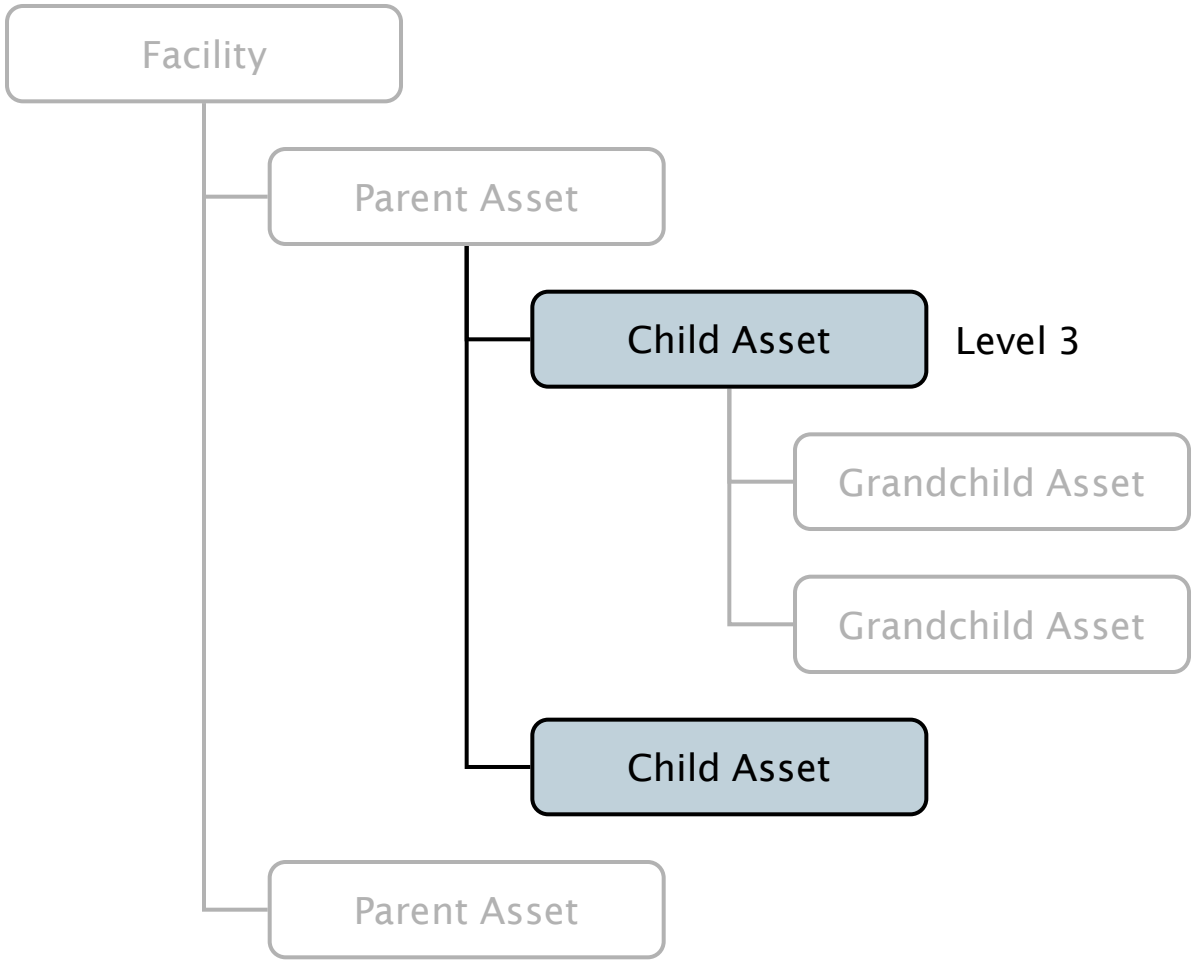
Asset hierarchy



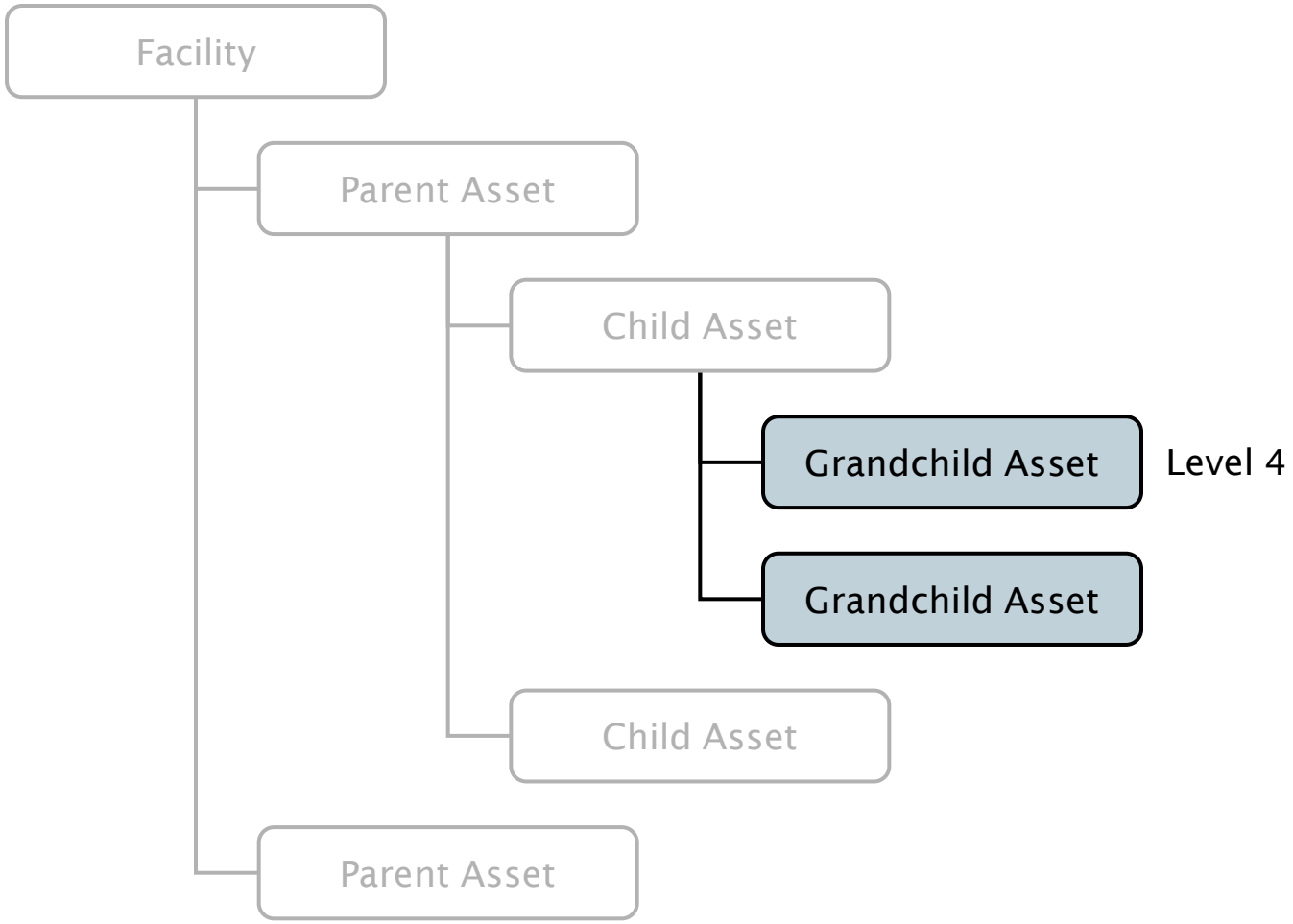
Asset hierarchy, levels 1 and 2



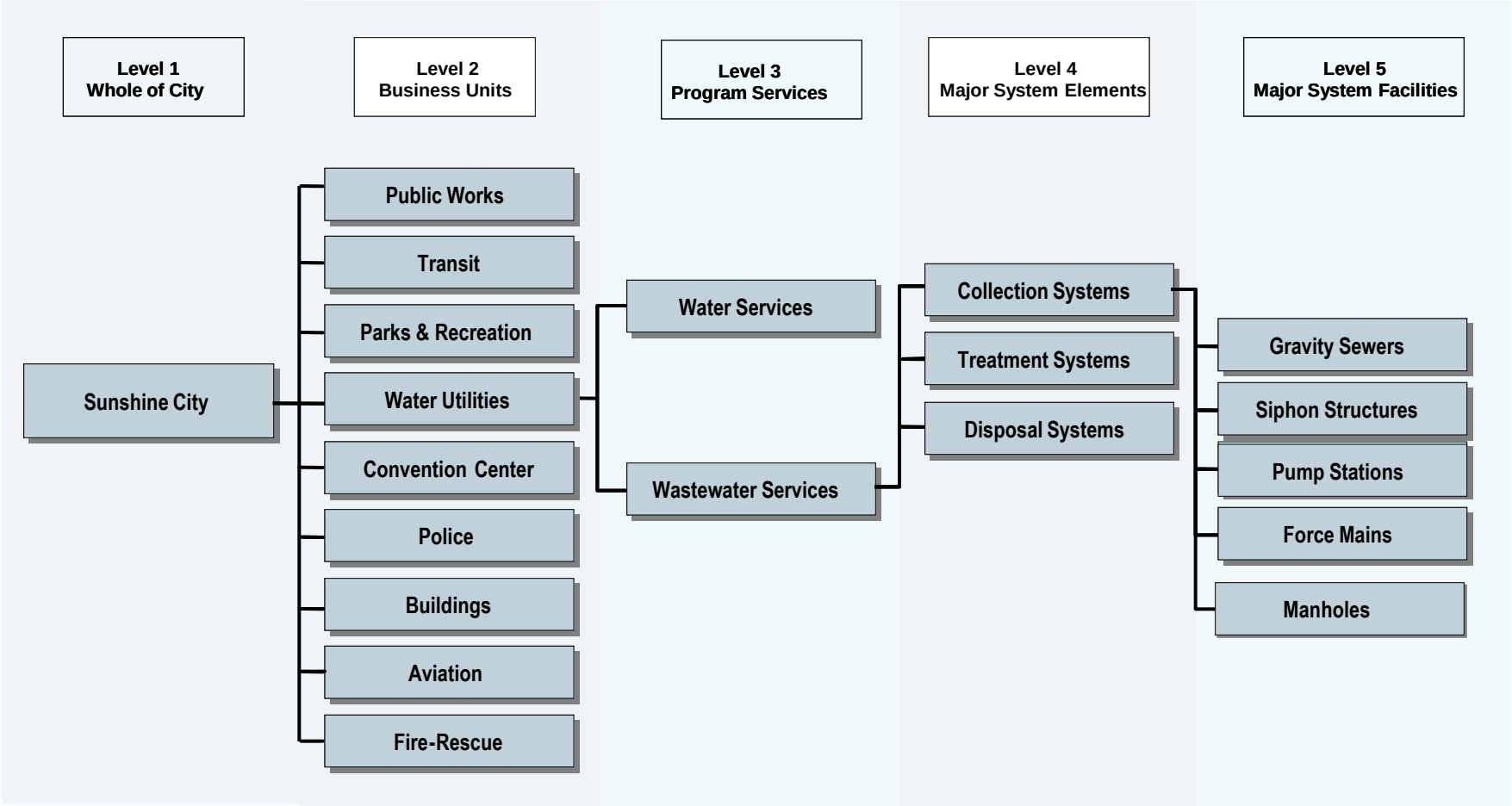
Asset hierarchy, level 3



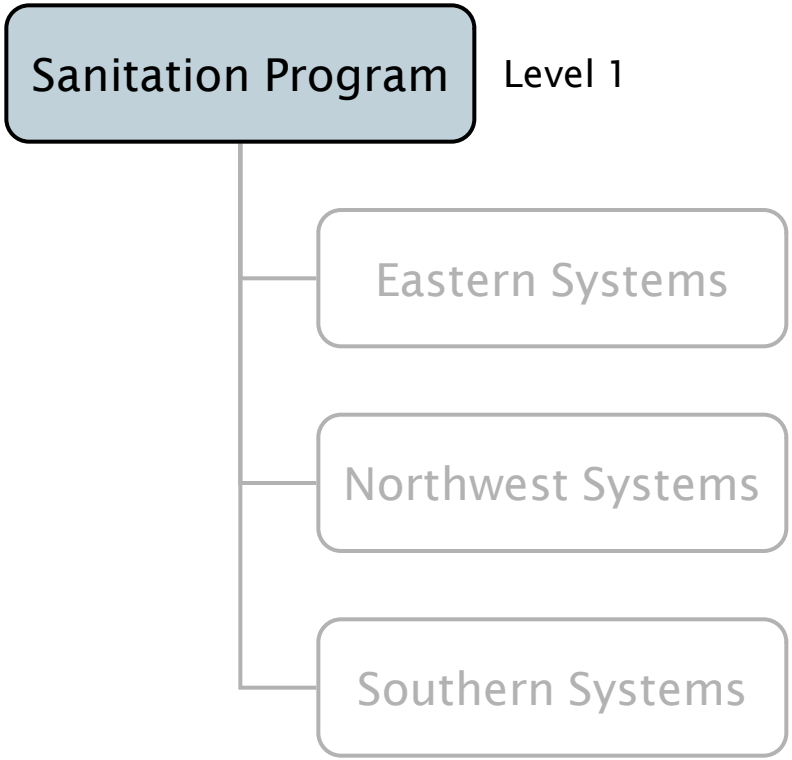
Asset hierarchy, level 4



“Whole of government” asset hierarchy



Asset hierarchy example, levels 1 and 2



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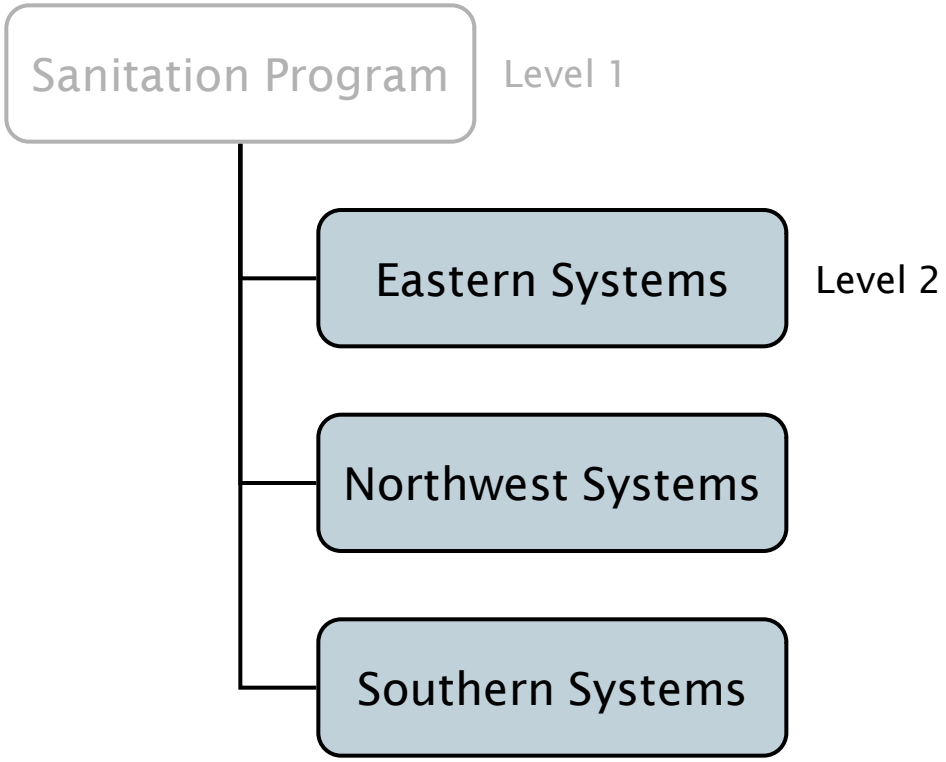

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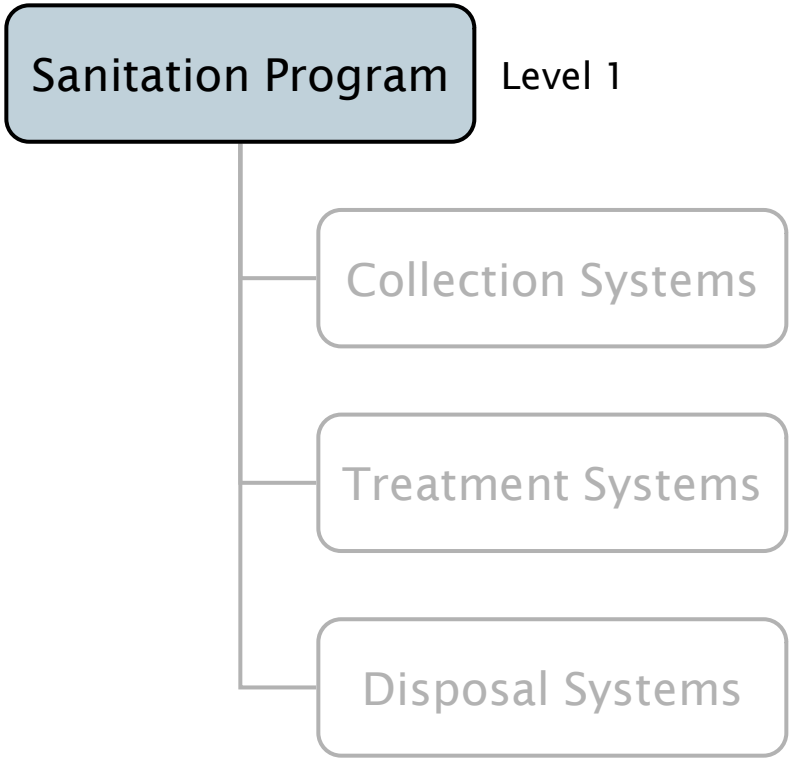

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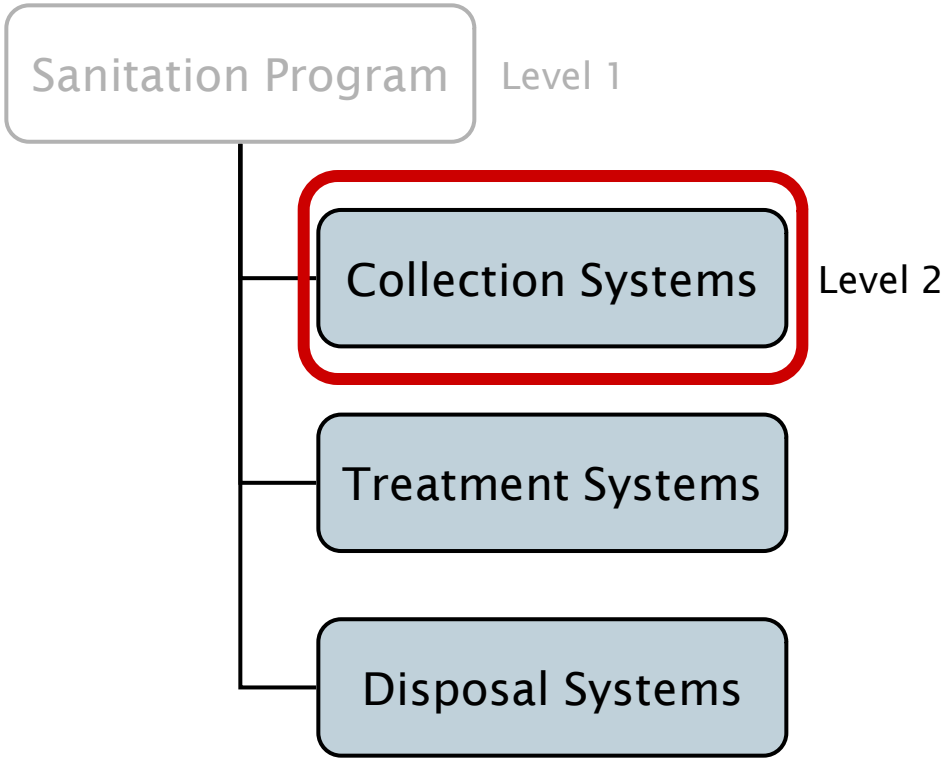
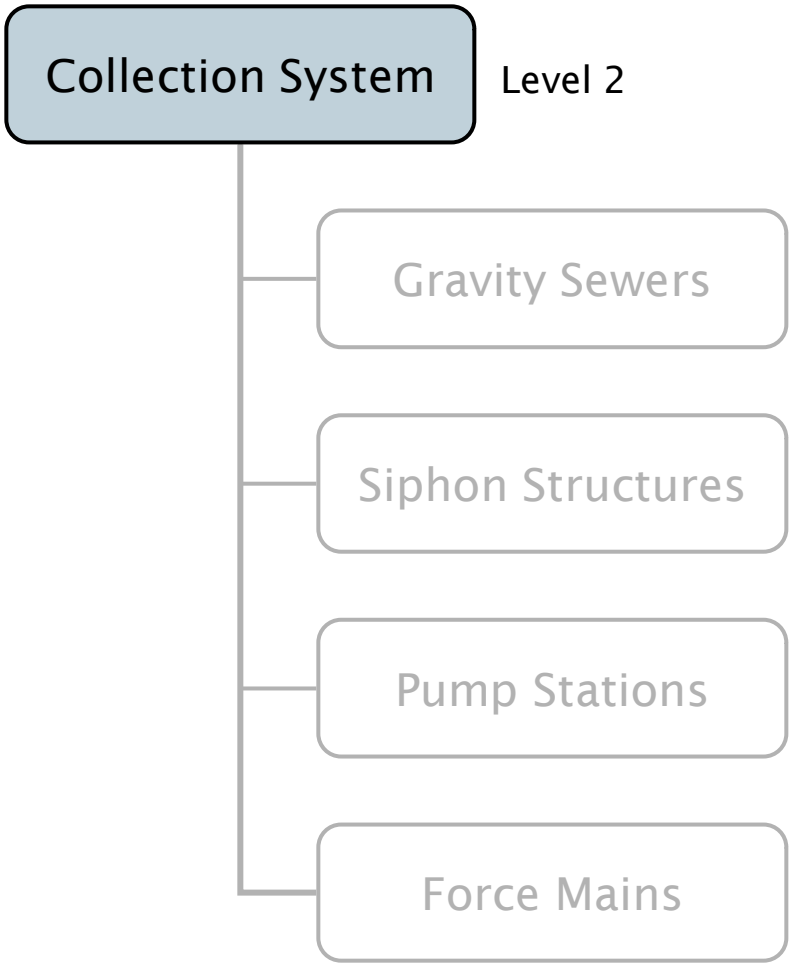
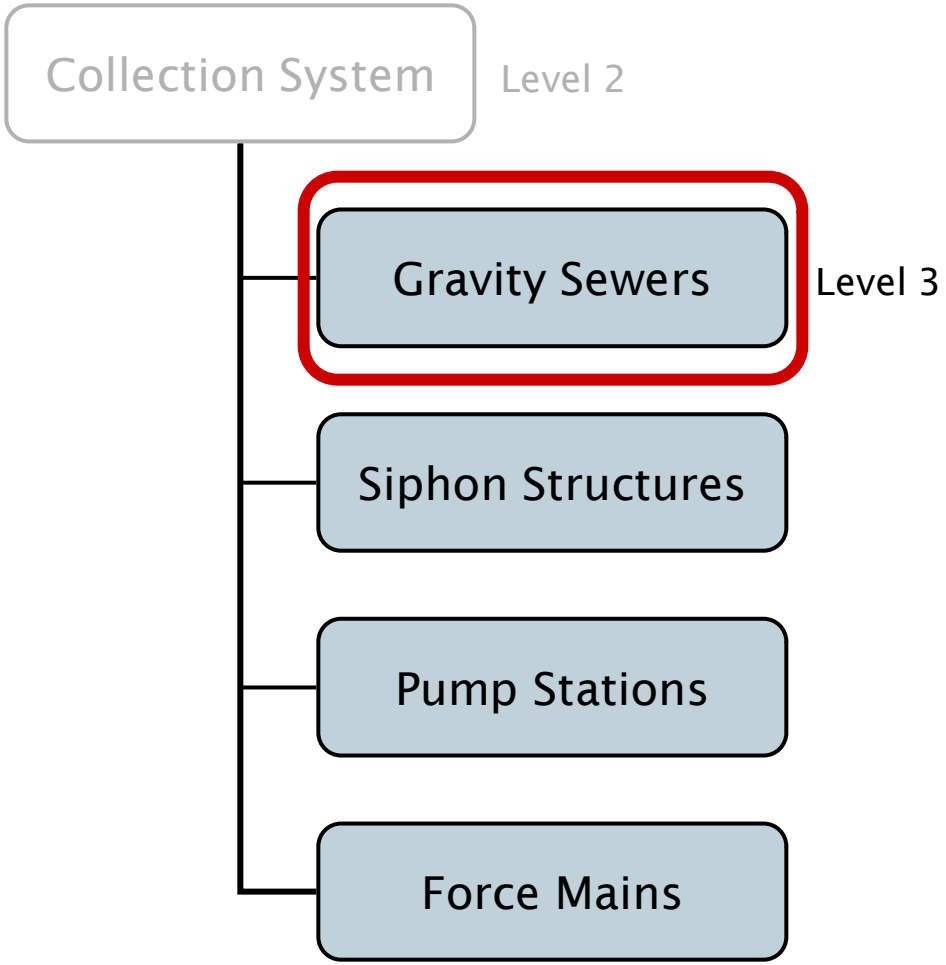


Asset hierarchy example, levels 2 and 3



Asset hierarchy example, levels 2 and 3



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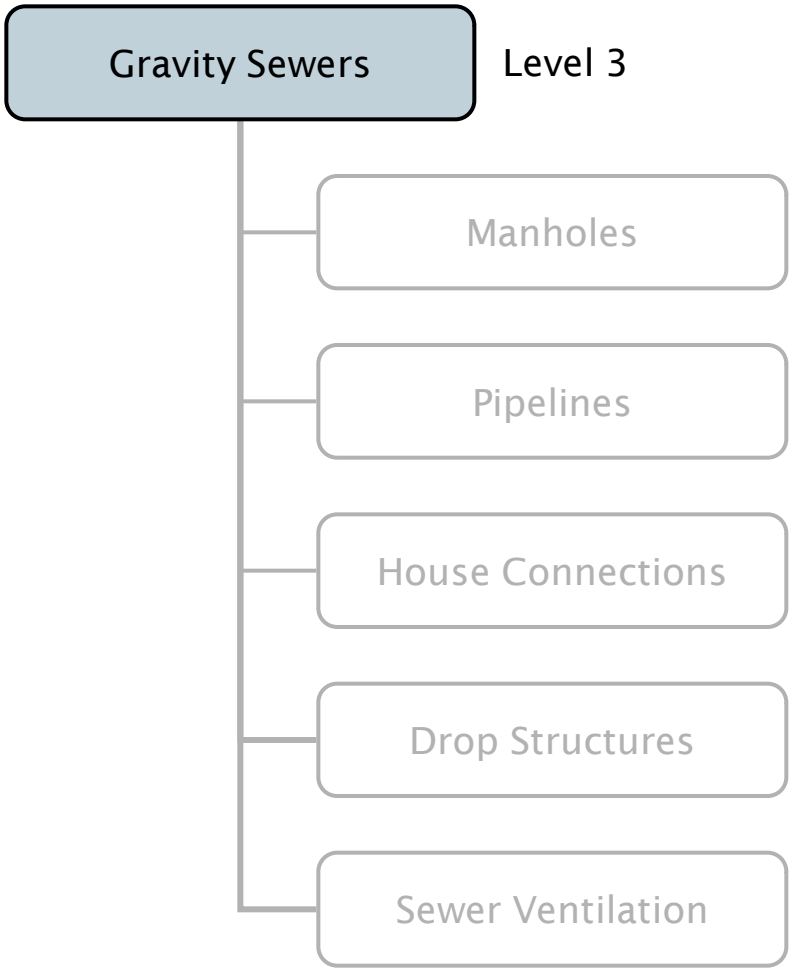

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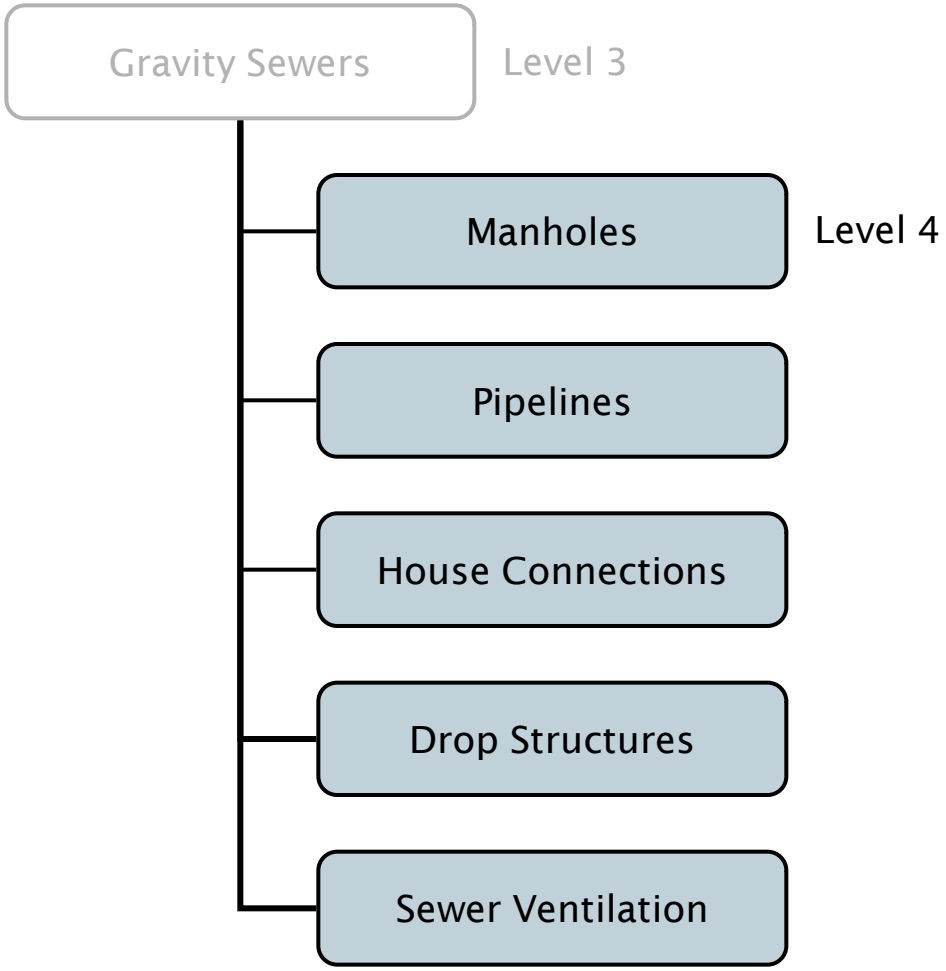

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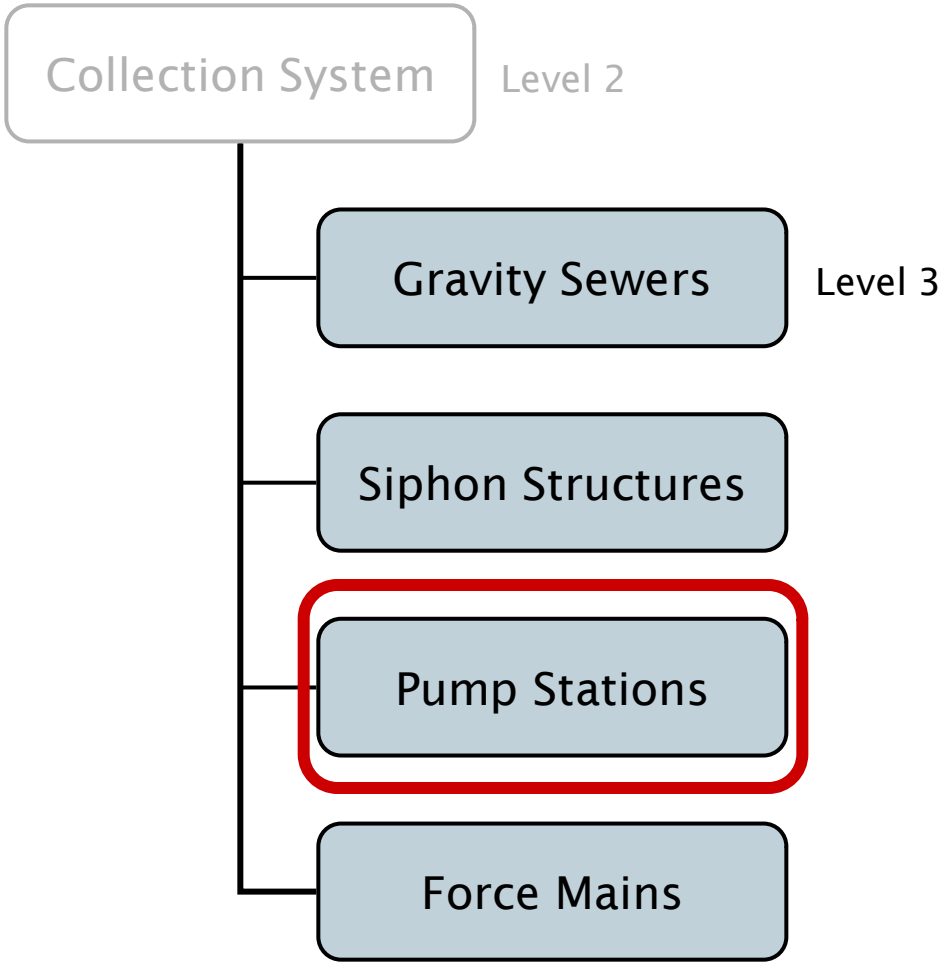

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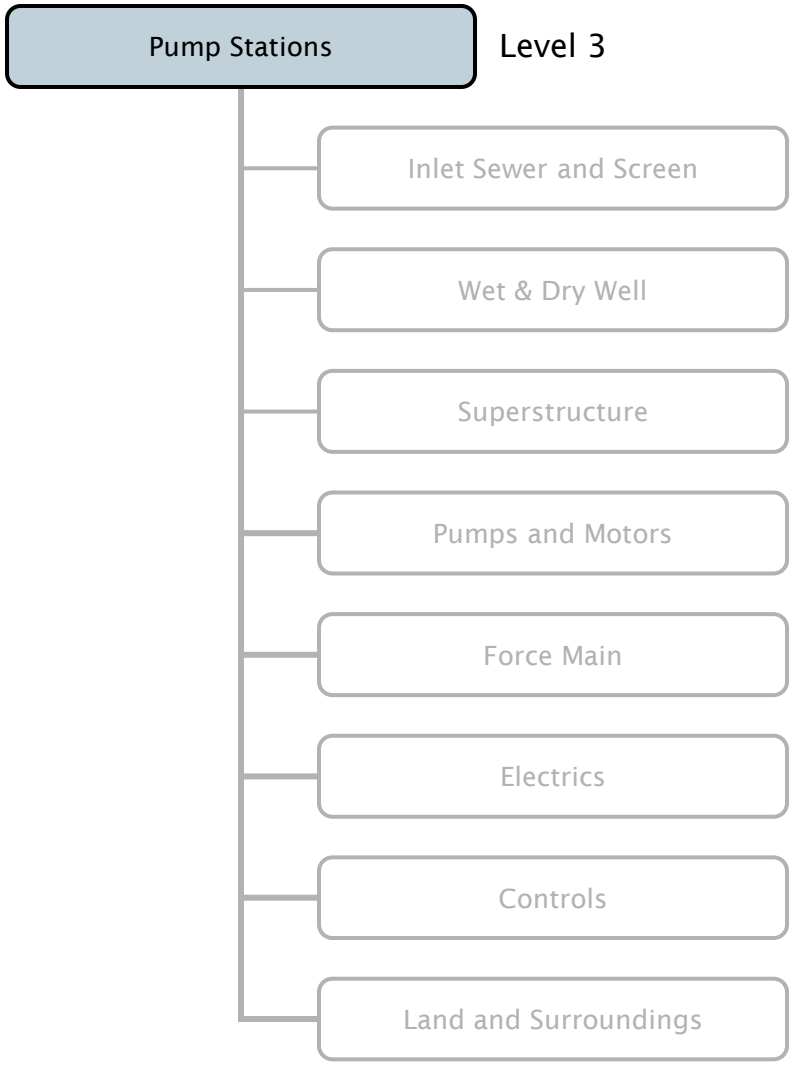

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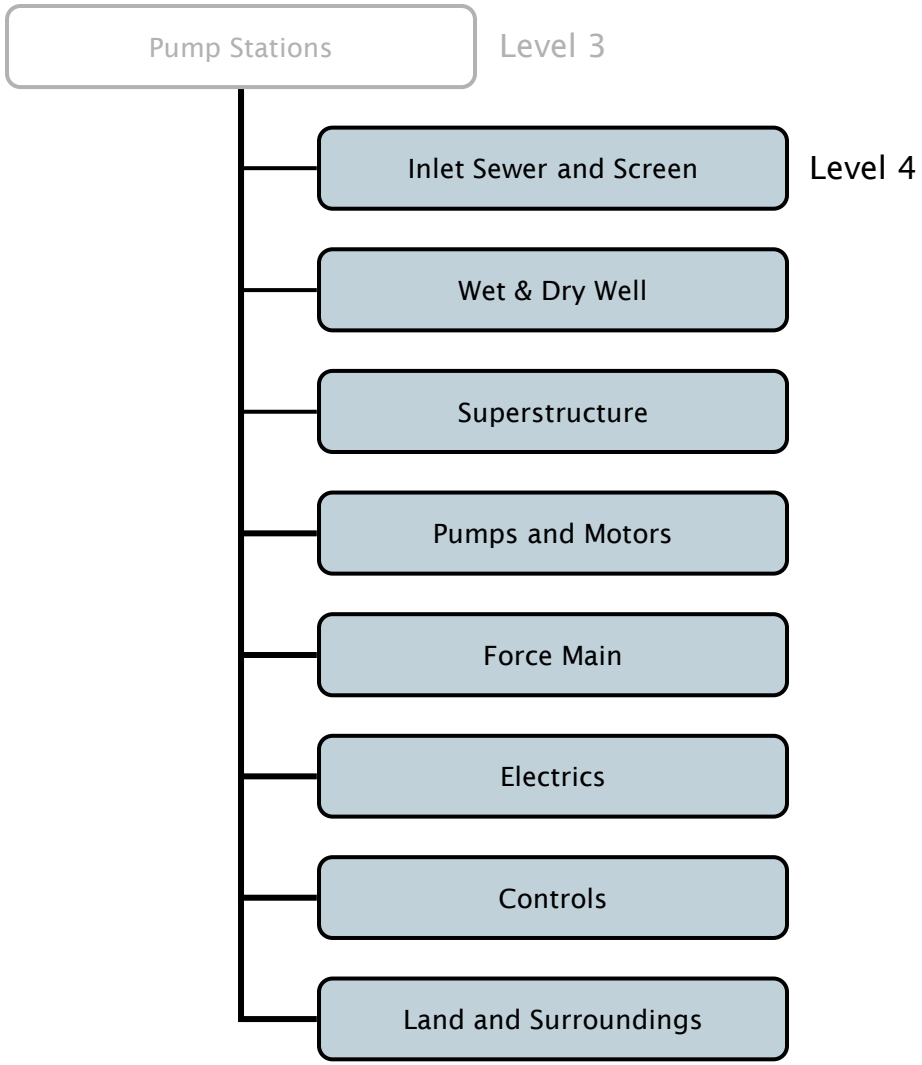
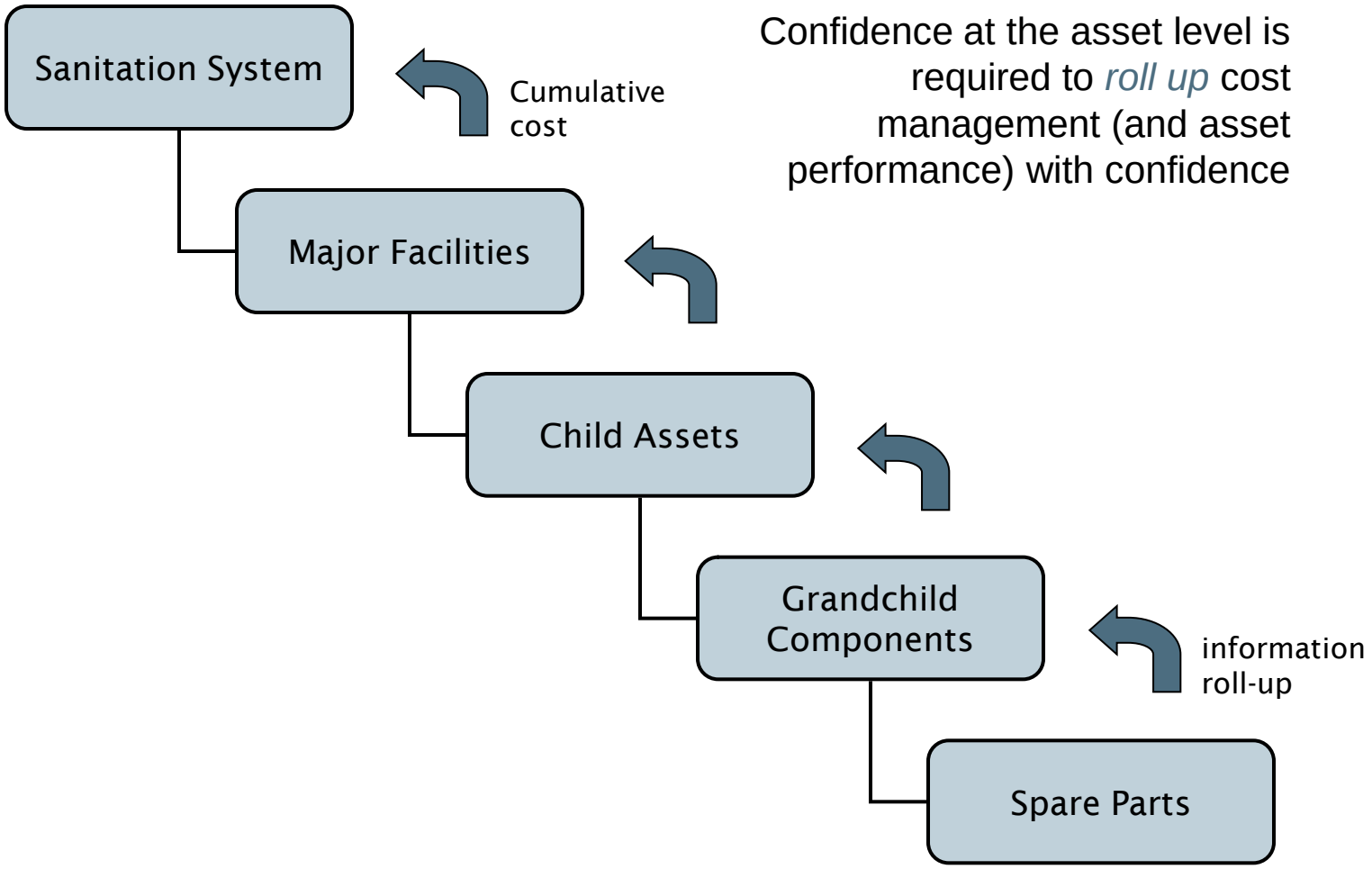


Roll up concept



Confidence at the asset level is required to *roll up* cost management (and asset performance) with confidence

Maintenance managed item

- *Maintenance managed item* (MMI) is an item at the lowest level—*the smallest subdivision*—of an asset registry composed as a nested hierarchy
- Typically, it is the level at which an asset is *maintained* (for example, parts are identified), or *decisions* are made to repair, refurbish, or replace

Asset

OR?

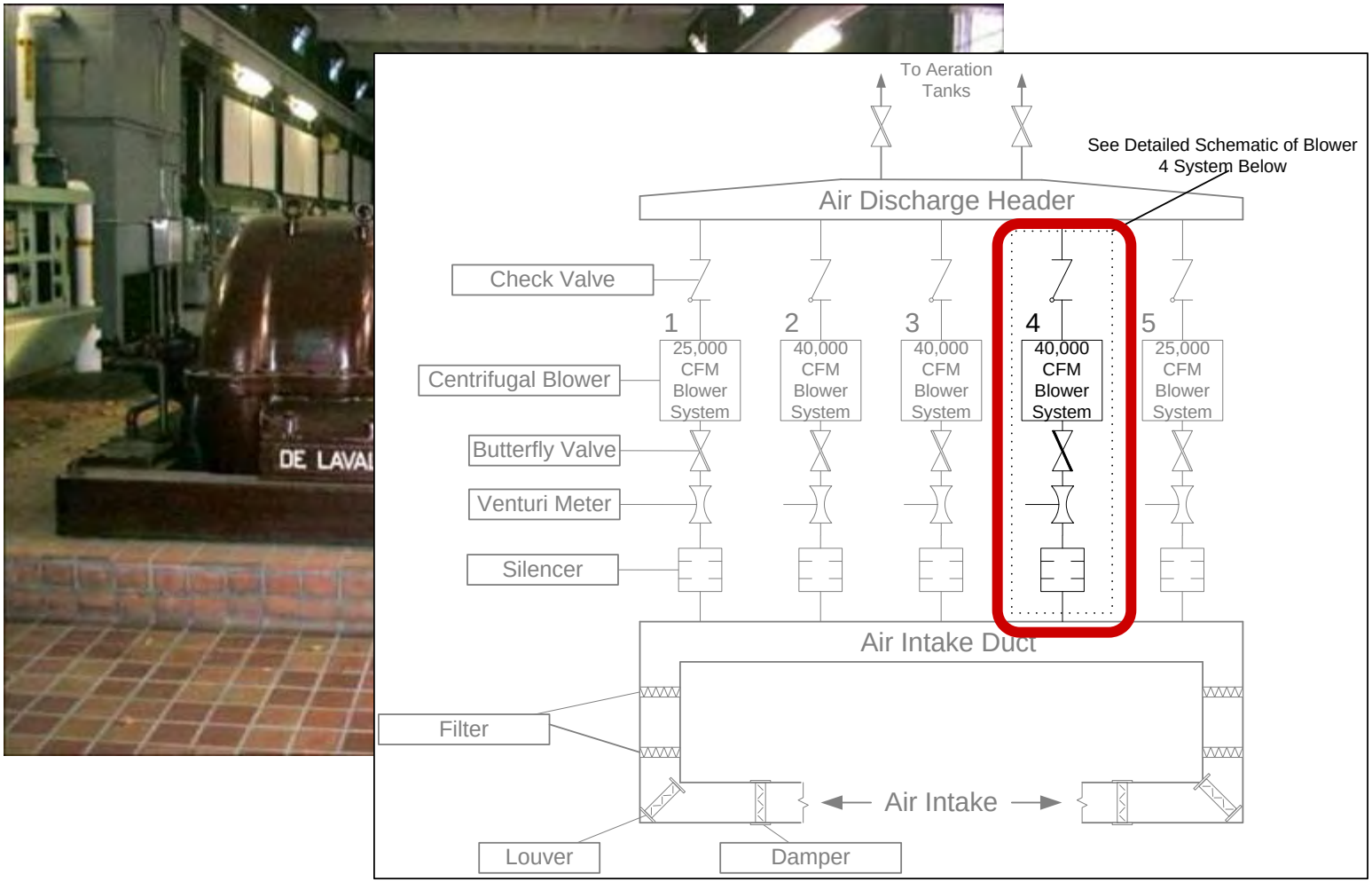
Component

Think “work order”

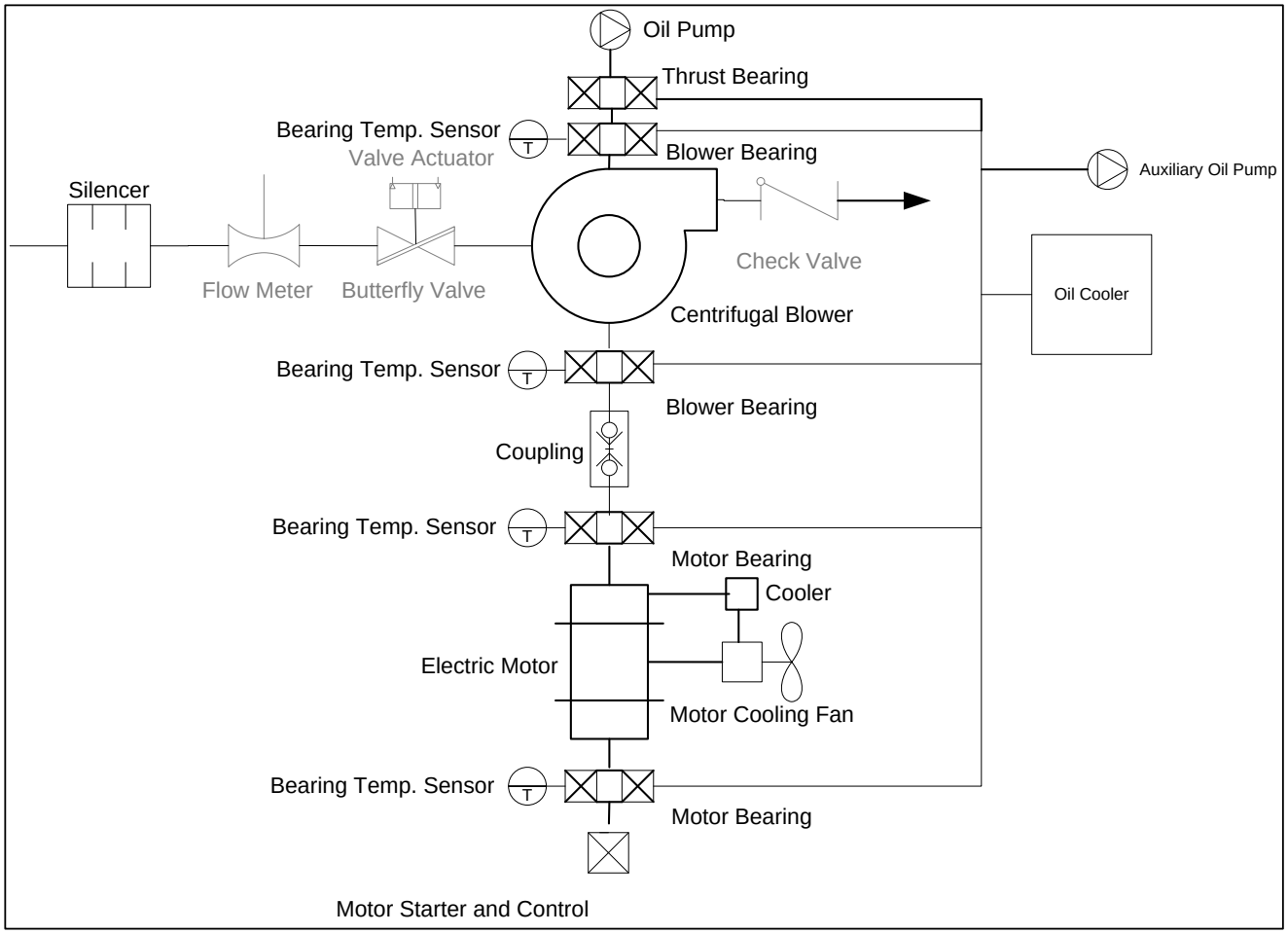
Stated another way…

- We manage the lifecycle of maintainable units (“maintenance managed items”), not components or parts
- A maintainable unit is repaired by replacing a component or part.
- A component is replaced upon failure, not repaired.

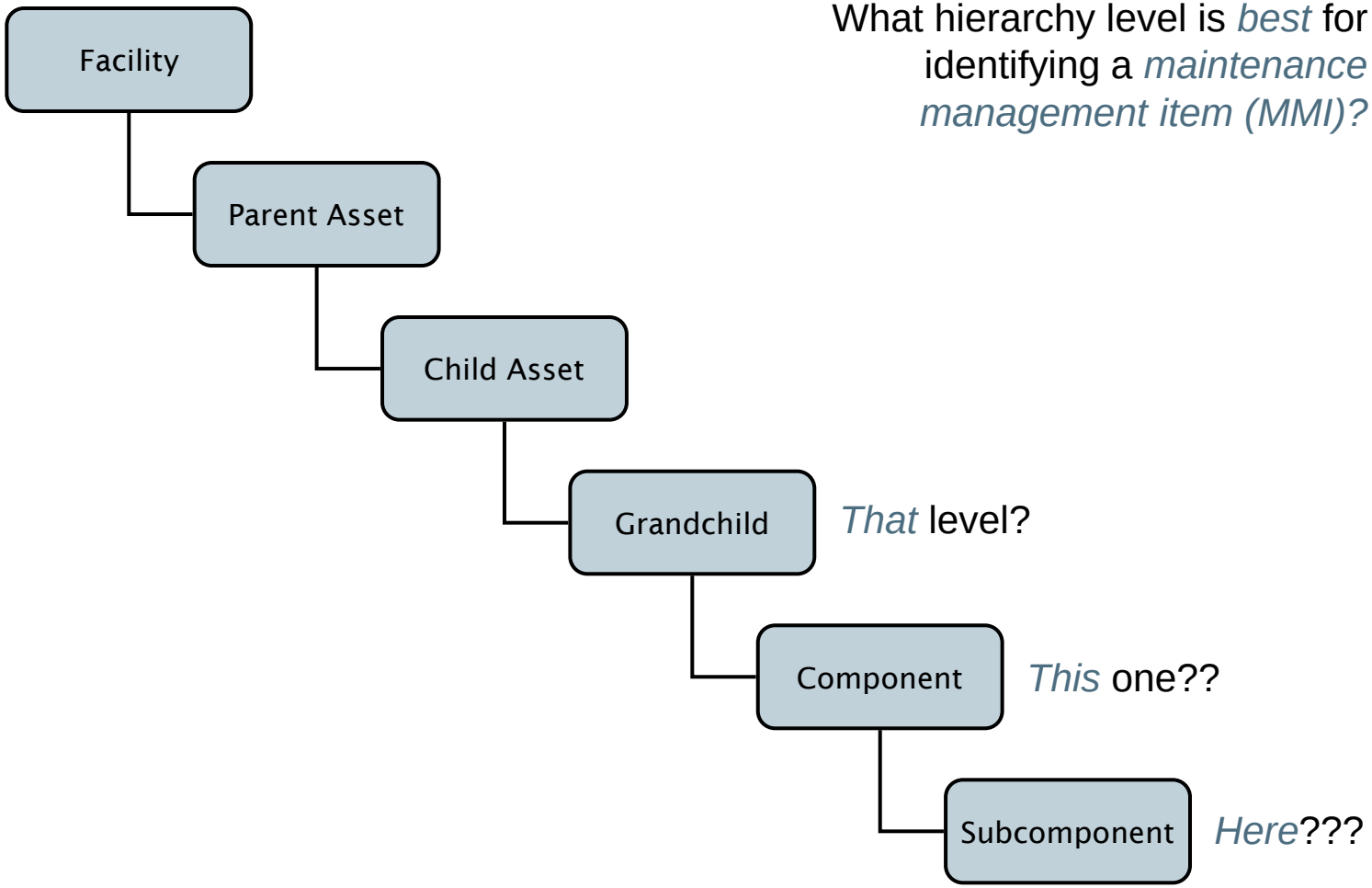
Using process layout with asset registry



Using process layout to build the asset registry

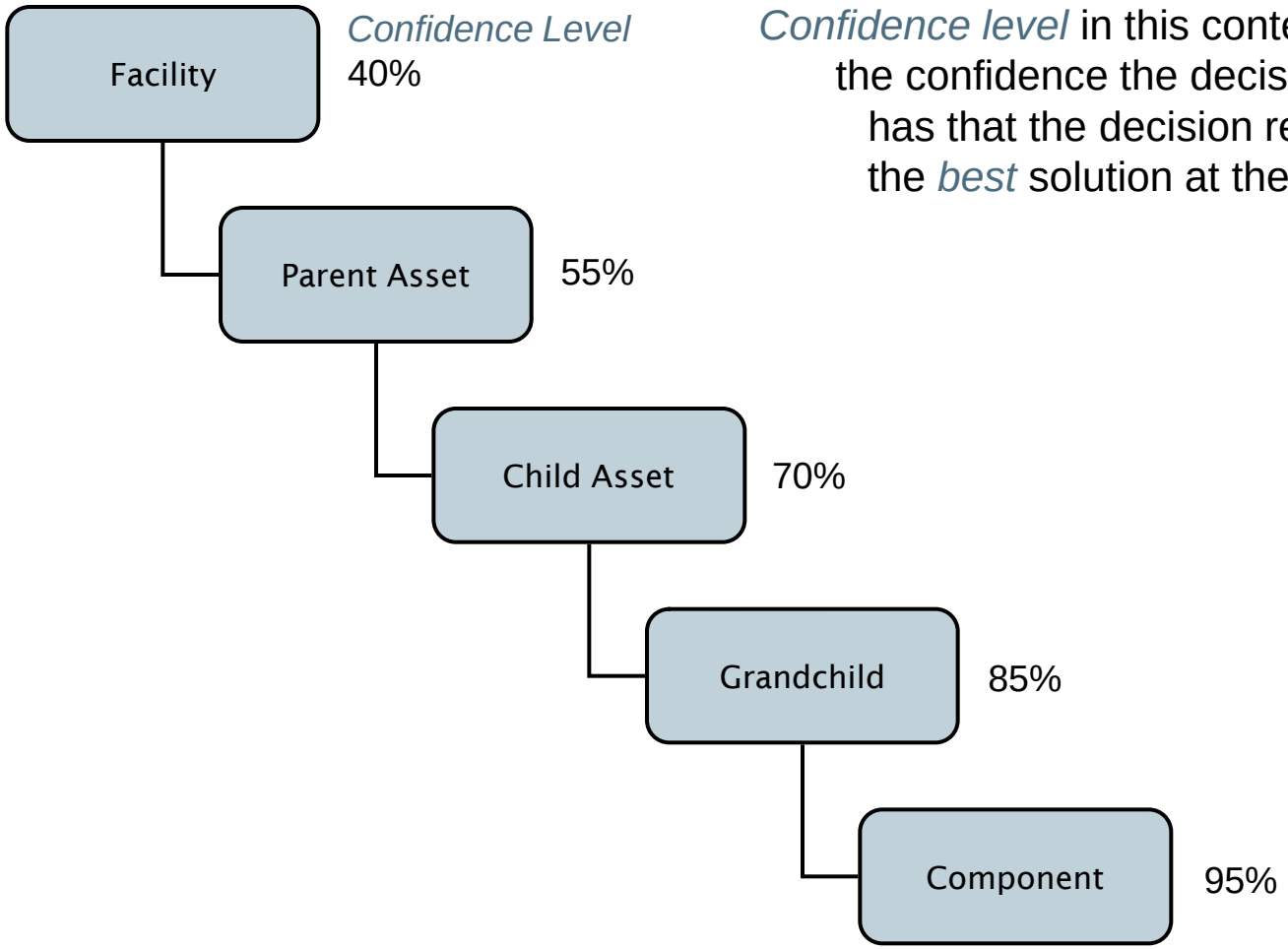


Asset hierarchy



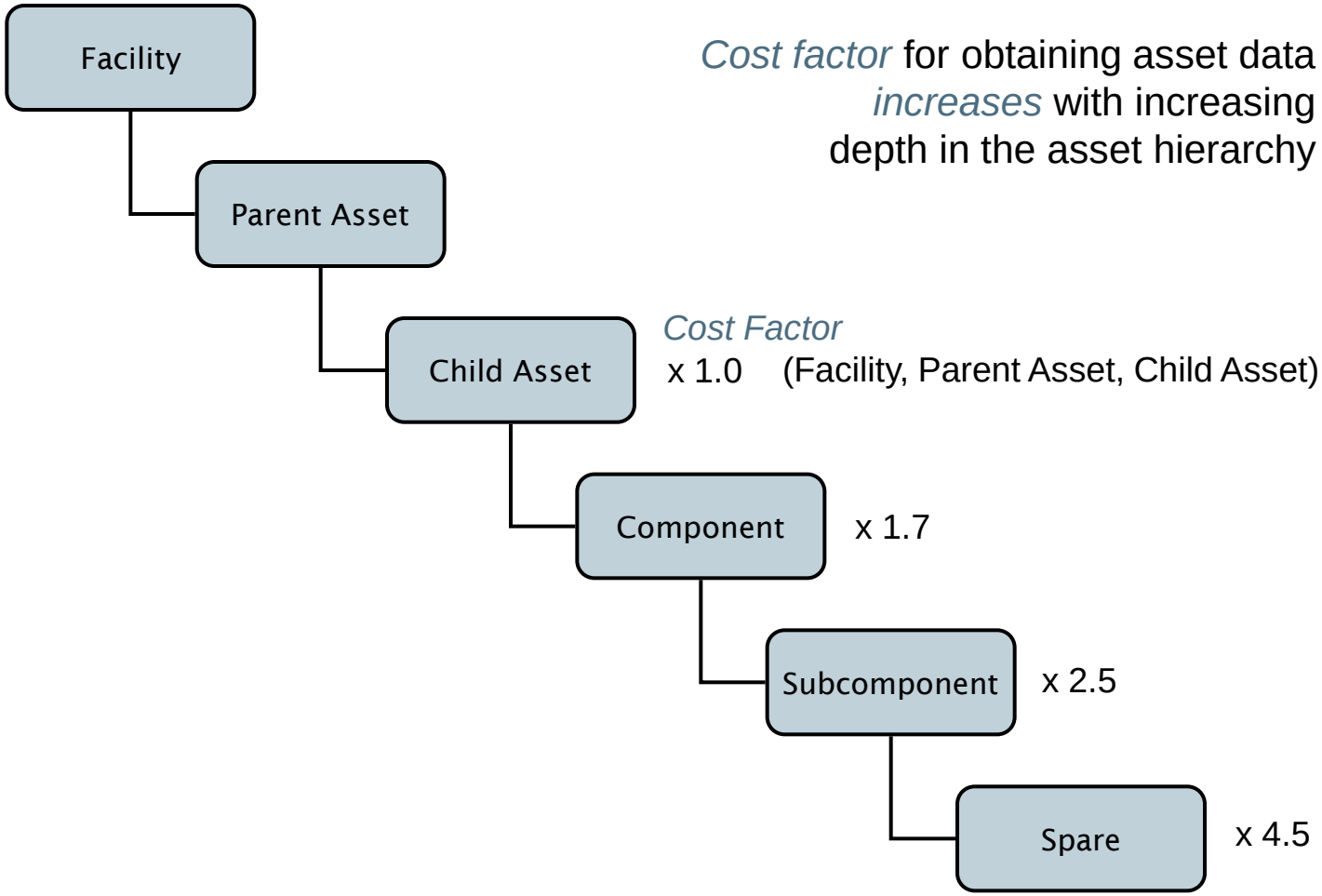
What hierarchy level is *best* for identifying a *maintenance management item (MMI)?*

Data confidence levels within asset hierarchy



Confidence level in this context means the confidence the decision-maker has that the decision rendered is the *best* solution at the *right* time

Data costs within asset hierarchy



Cost factor for obtaining asset data *increases* with increasing depth in the asset hierarchy

Cost Factor

x 1.0 (Facility, Parent Asset, Child Asset)

x 1.7

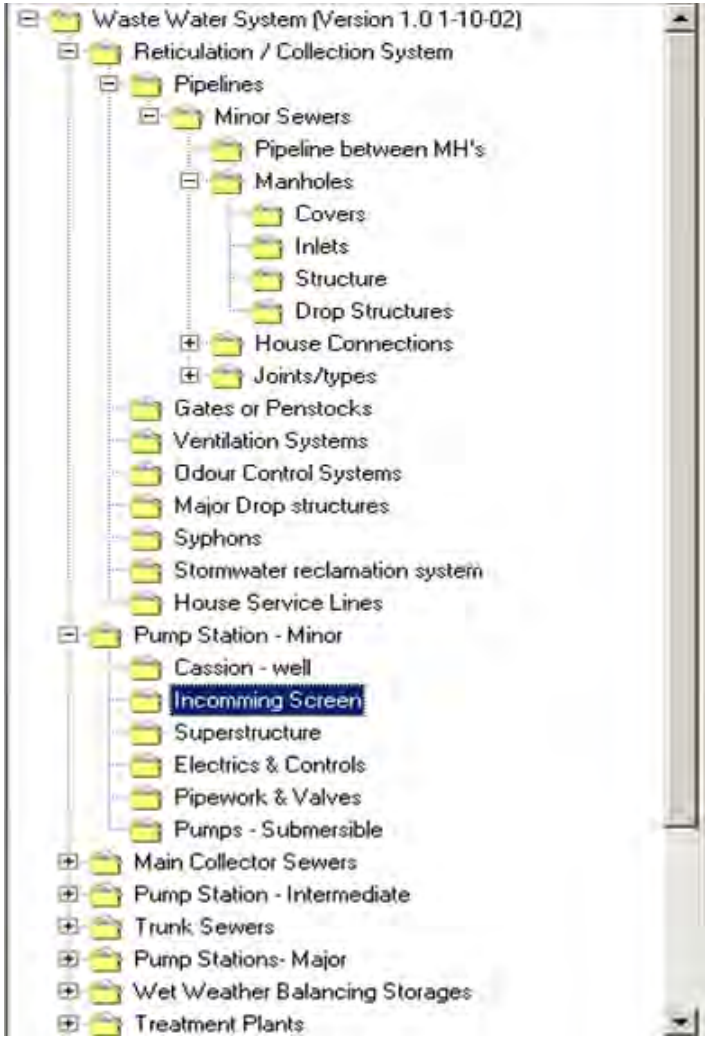
x 2.5

x 4.5

Examples of tree-style asset hierarchy

Asset Hierarchy

1	2	3	4	5	6	7	8	Level 9 Name
Sanitation System								
	Disposal System							
	Collection System							
	Treatment Plants							
		Westerly Treatment Plant						
		Southerly Treatment Plant						
		Easterly Treatment Plant						
			Aeration System					
			Aeration Facility					
				Building & Services				
				Intake Header				
				Blower Assembly				
					Motor Starter			
					Blower Assembly 1			
					Blower Assembly 1			
					Blower Assembly 1			
					Blower Assembly 4			
						Rear motor bearing		
						Rear bearing temp sensor		
						Oil lube/cooling system		
							Oil pump	
							Circulation tubing	
							Oil sensor	
						Motor Cooling System		
							Cooling Water Pumps	
							Eletric Motor for Cooling System	
							Piping and valves	
						Electric motor		
						Front motor bearing		
						Front bearing temp sensor		
						Coupling		
						Rear blower bearing		
						Rear bearing temp sensor		
						Centrifugal blower		
							Housing	
							Main shaft	
							Impeller	
							Seals	
						Front bearing temp sensor		
						Front blower bearing		
						Discharge check valve		
						Inlet butterfly valve		
						Silencer		
						Flow Meter		
						Thrust Bearing		
					Blower Assembly 5			
				Discharge Header				
			Aeration Tanks					



Data standard

Written record:

- Asset identification naming convention
- Attributes
- Record layouts
- Database architecture and protocols
- Data collection protocols

Asset ID naming convention issues

- What is an asset? (What gets a unique ID?)
- Who creates the asset ID?
- How is it assigned?
  - Linear (pipe) vs. vertical (plant) assets
    - Geo-reference
    - CAD versus GIS
  - Active vs. passive
    - Lock-out/tag-out
    - Asset ID vs. asset location for mobile assets

CAD is computer-aided design, GIS is geographic information system

Data collection strategy

ATTRIBUTE	SOURCE	LEVEL	USE
Asset List	SPL / Drawings	Asset	All
Asset Hierarchical	SPL / Drawings	Asset	All
Asset ID / Number	SPL / Data Standard	Asset	All
Asset Status	Field Inspection, Staff Interviews	Asset	All
Asset Type	SPL / Data Standard	Asset	See Level Column
Installation Date	Drawings / Staff Interviews	Asset	Renewal Timing
Last Rehab Date	Staff Interviews	Asset	Renewal Timing
Size	Drawings / Field Inspection	Asset	CoF, Valuation
Size Unit	Drawings / Field Inspection	Asset	CoF, Valuation
Length	Drawings / Field Inspection	Asset	CoF, Valuation
Length Unit	Drawings / Field Inspection	Asset	CoF, Valuation
Capacity	Drawings / Field Inspection	Asset	CoF, Valuation
Capacity Unit	Drawings / Field Inspection	Asset	CoF, Valuation
Condition	Inspection, Staff Interviews	Asset	Renew Timing, PoF

-
-
-

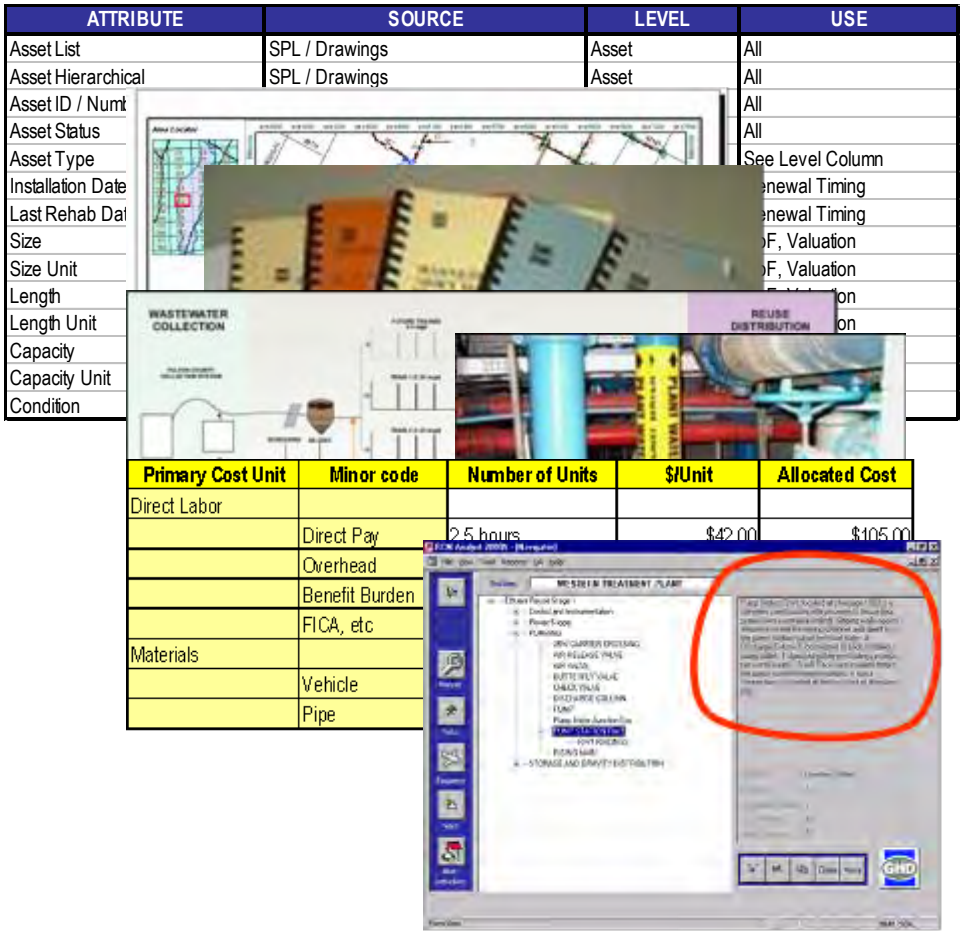
Etc.

Use drives collection strategy!

Major components of asset data

Tied to the *asset ID*…

- Physical attributes
- Geo-reference
- O&M manuals
- Drawings and photos
- Life cycle costs
- Knowledge and strategy



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Asset ID / Numb			All
Asset Status			All
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Installation Date			enewal Timing
Last Rehab Dat			enewal Timing
Size			F, Valuation
Size Unit			F, Valuation
Length			on
Length Unit			on
Capacity			
Capacity Unit			
Condition			

Primary Cost Unit	Minor code	Number of Units	$/Unit	Allocated Cost
Direct Labor				
	Direct Pay	2.5 hours	$42.00	$105.00
	Overhead			
	Benefit Burden			
	FICA, etc			
Materials				
	Vehicle			
	Pipe			

Two approaches to generating registry data

What we already have—retrospective

- *Critical first*
- Use existing crews as they respond to Work Orders
- Use engineering students

What we are about to acquire—prospective

- Tie to commissioning or handover process
- Use contract retainage to ensure control

Recording data—new technology

Ricoh Caplio Pro G3

Data responsibilities: example

Data Task	*Organization Group*
Asset details	Operations
Condition assessment	Maintenance
Asset values	Engineering
Residual physical lives	Engineering
Probability of failure	Maintenance
Consequence of failure	Engineering
Business risk exposure	Engineering
Optimal renewal strategy	Maintenance or Engineering

Key points from this session

What do I own and where is it?

Key Points:

- We have to know what we have before we can manage appropriately what residual life is left.
- Everything in AM starts with the Asset Registry.
- The “data standard” is the key building block for AM asset registries.

Associated Techniques:

- Asset registry/inventory
- Data standards, asset hierarchy
- System maps
- Delphi approach to locating other sources of data
- Process diagrams
- “Handover” procedures

Tom's spreadsheet